

EXERCISE 5

OPTION A

- 1 Investigate the processes that are involved in producing nuclear energy.
- 2 a Produce an annotated visual display showing how electricity is produced from a nuclear reactor.
b Add a section describing how the waste produced in a nuclear reactor is dealt with.
- c Research some of the new procedures of nuclear waste disposal that are being developed in the hope that a safe and permanent solution to the problem can be found.
- 3 Describe the social and environmental issues involved in nuclear energy production.

OPTION B

- 1 Research the Chernobyl reactor accident and the problems of nuclear power generation in more detail.
- 2 Use the information which you gather to write an essay in response to the following topic:
'Nuclear energy is an efficient way of producing power. If we used it to produce power in Australia, an accident would be unlikely and not as dangerous as the Chernobyl reactor accident.' Discuss.

Alternative energies for the future

It is clear from news reports all over the globe today that the world's most used energy sources, fossil fuels, are rapidly decreasing. Consequently, there is an urgent need to find alternative energy sources. However, any alternatives that are chosen need to be sustainable and create minimal damage to the environment. Will technological advances be able to supply the energy demands of the future at an affordable price? Which is more important: cost or the environment? Eventually, the global community may not be left with a choice.

Much has been written on many alternative sources currently in use, such as water power (**hydro-electricity**), Sun (**solar energy**), **wind** and **geothermal energy**. Other lesser known sources include the use of ocean waves, tidal energy and the organic alternative collectively referred to as **biomass**.

Perhaps the most important consideration for people today, though, is the concept of **energy conservation**, or cutting back on their use of energy. The choices we make in living our lives now and how we put the theory of energy efficiency into practice will determine our energy future.

EXERCISE 6

OPTION A

1 a Using the information contained in Figures 8.14 and 8.15, match up the description of each alternative energy source with its correct name and corresponding diagram.

b Table 8.4 on page 224 lists some of the possible effects of using alternative energy sources. Suggest examples of possible effects for each of the alternative energy sources outlined in question 1a.

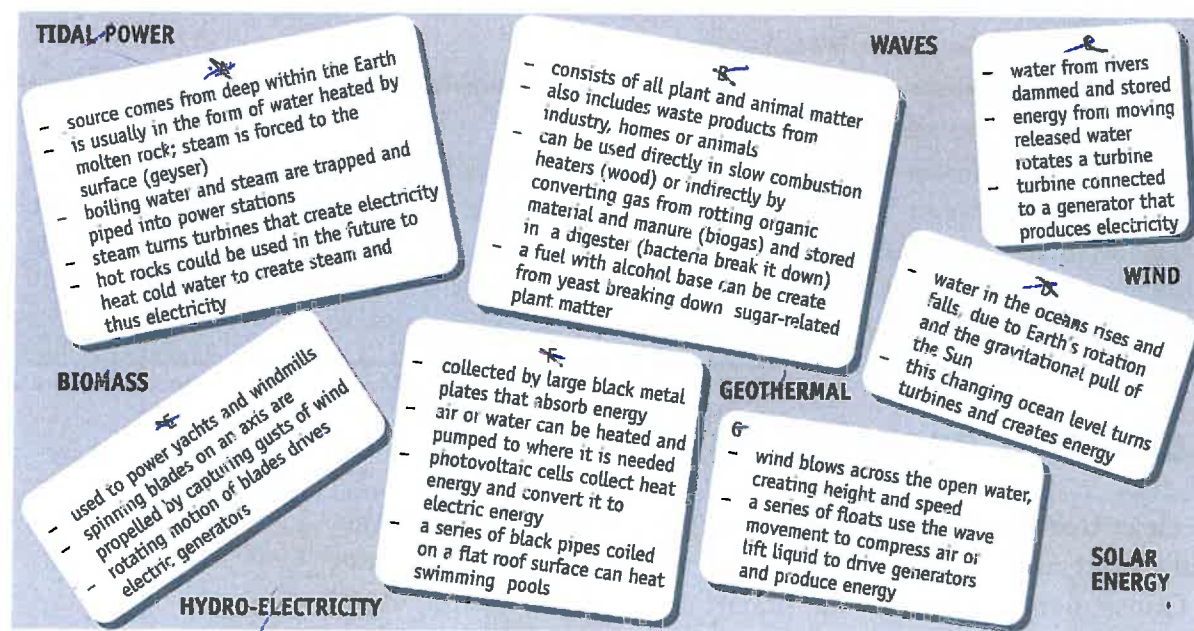


Figure 8.14 Alternative energy sources: descriptions

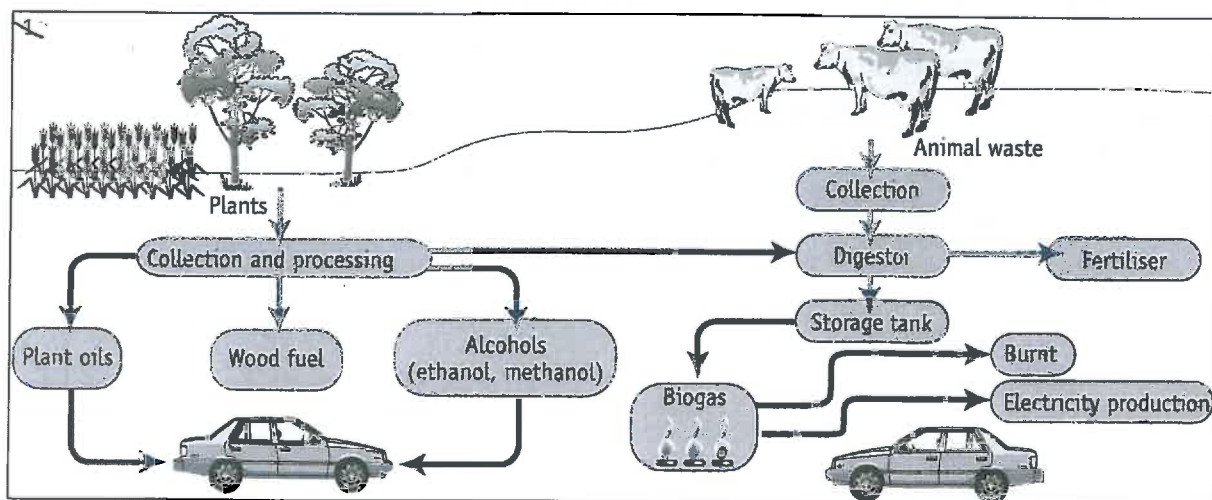
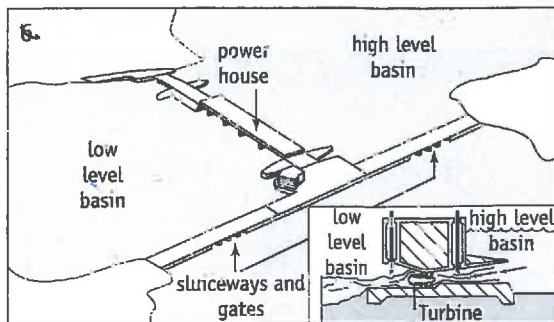
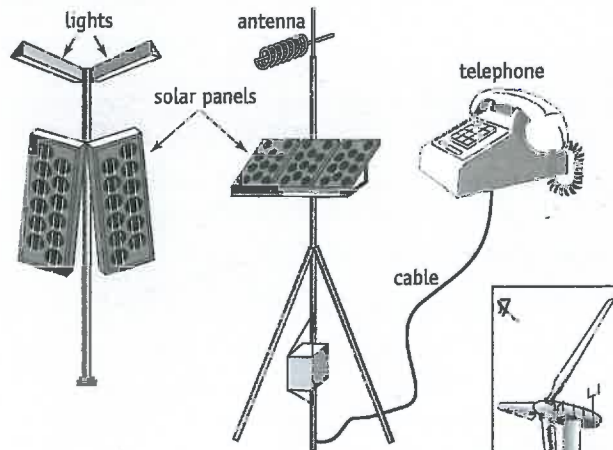
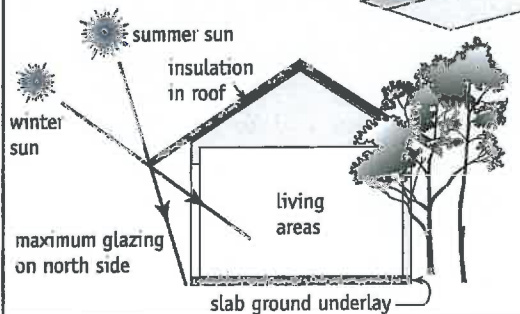
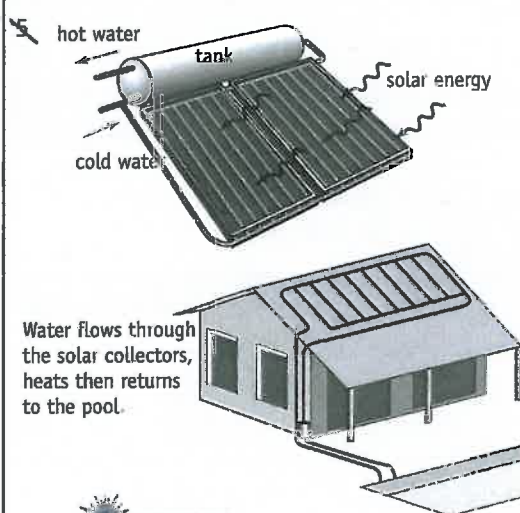
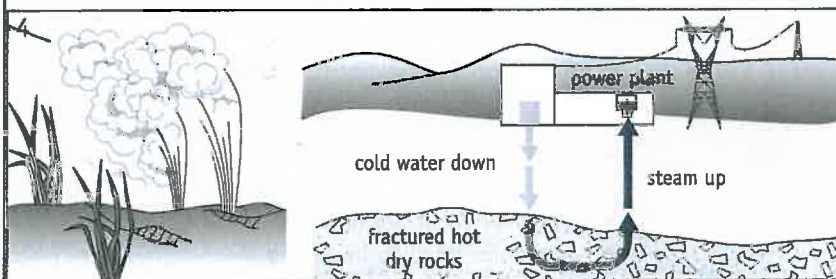
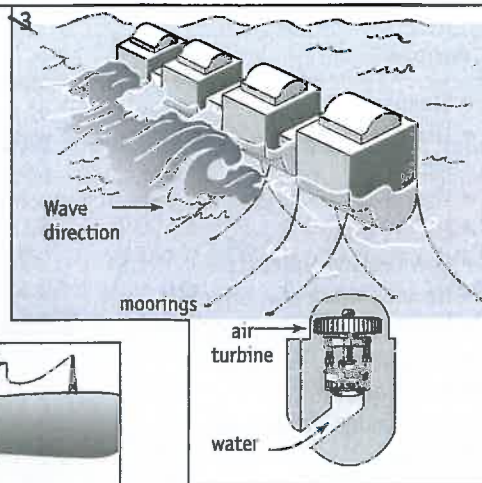
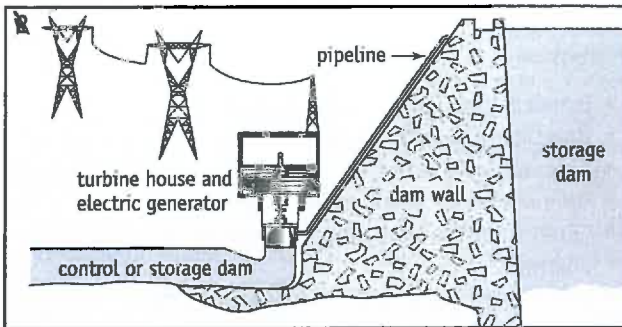


Figure 8.15 Alternative energy sources: diagrams

EXERCISE 6 (cont.)



EXERCISE 6 (cont.)

Table 8.4 Possible effects of using alternative energy sources

<i>Positive</i>	<i>Negative</i>
<ul style="list-style-type: none"> • Clean • Useful if there is a constant reliable water supply • Useful for small jobs not requiring much energy • Occurs daily • Low setting up costs • No environmental effects • Handy for isolated and remote settlements • Renewable • Non-polluting • Can reduce power bills • Reliable • Makes use of otherwise waste materials • No wastage in creation of the energy 	<ul style="list-style-type: none"> • Flooded river valley causes habitat loss • Dams can fill with silt and clog up • Released cold water has little O₂ and can kill fish • Only useful for small communities • Could interfere with shipping and navigational channels • Interrupted wave motion may affect the development of coastlines • Large surface area required • Large ones could affect migratory birds • Has a low frequency buzzing sound • Can interfere with TV and radio reception • Initial cost is high • Batteries required to store energy • Silicon for construction must be mined first • Large holes need to be drilled • Some land used for plantations instead of food production

2 Using your atlas and other research sources, find maps of the areas in Australia where these alternative energy sources are located or currently in use. Suggest reasons to account for their distribution.

The Internet can be a good base for finding out information on these regions of alternative energy. Contact the appropriate government department in your State also.

OPTION B

Refer to Table 8.5.

1 Draw a series of graphs showing the proportion of money spent on the various socio-economic objectives by each type of organisation. Remember that you should use the same type in each case because you will be comparing them.

Use **Skill Sheets 3 and 4** to help you select and draw the graphs. Use 2 mm graph paper for accuracy.

2 Describe importance of the monies spent on renewable energy and conservation by each type of organisation. What does this tell you about the priorities of Australia's present society?

3 Compare the outlays made by business, government, education and non-profit organisations. Which body do you think is *most* concerned about the environment? Justify your answer.

EXERCISE 6 (cont.)

Table 8.5 Research and experimental development for energy supply: 1992-93

Socio-economic objective	Business enterprise \$'000	Common-wealth government \$'000	State government \$'000	Higher education \$'000	Private non-profit \$'000	Total \$'000
✗ Energy transformation	27 599.9	8 682.1	1 393.8	5 007.3	0.0	42 643.1
✗ Renewable energy	5 357.9	464.0	0.0	10 469.6	0.0	16 291.5
Hydro-electric	N.A.	0.0	0.0	0.0	0.0	N.A.
Wind	N.A.	213.0	0.0	115.0	0.0	N.A.
Ocean	N.A.	39.0	0.0	120.9	0.0	N.A.
Solar—thermal	N.A.	0.0	0.0	360.9	0.0	N.A.
Solar—photoelectric	N.A.	212.0	0.0	722.1	0.0	N.A.
Solar—thermal electric	N.A.	0.0	0.0	8 670.4	0.0	N.A.
Not classified (e.g. geothermal)	N.A.	0.0	0.0	480.3	0.0	N.A.
✗ Energy distribution	13 605.7	3 549.0	0.0	6 862.0	41.3	24 058.0
✗ Conservation and efficiency	8 199.8	1 934.5	467.5	4 445.6	143.1	15 190.5
✗ Other	660.5	1 734.3	0.0	4 098.0	0.0	6 492.8
Total	55 383.8	16 363.9	1 861.3	30 882.5	184.4	104 675.9

Source: Australian Bureau of Statistics, *Energy Accounts for Australia*, cat. no. 4604.0

OPTION C

Figure 8.16 The concept of appropriate technology (Adapted from *Global Issues*, vol. 2, no. 2, 1996)

IS IT APPROPRIATE?
A CHECK LIST

- simple and cheap to run?
- can they afford it?
- makes full use of local materials, skills and ingenuity?
- can it be kept running easily e.g. spare parts, repairs?
- uses resources efficiently, especially non-renewable resources?
- kind to the environment (no or minimal pollution)?
- owned and controlled by those using it?
- kind to the health and welfare of users?
- solves local problems?
- provides local employment?
- training needed to operate?
- gives users self-respect and confidence?
- encourages users to be more self-reliant?
- is it cheaper and more efficient than what is already in use?
- fits in with the local social and cultural environment?

THE REALLY USEFUL TRACTOR



A. 'Here's what you need. It's yours!'



B. 'Hmmm ... Very nice, but is it appropriate?'



C 'Appropriate technology —local style'

STOVES: POSITIVES AND PROBLEMS

Forty-five per cent of all trees cut down are used for firewood and half the world's people still depend on wood for heating their homes and cooking their food.

In Africa (excluding South Africa) traditional fuels (firewood, animal dung and plant residue) supply more than 65 per cent of total energy demand.

Women in Upper Volta may have to walk for 4-6 hours three times a week to gather enough wood to cook the evening meals. In Tanzania, it may take 300 person-days (usually women-days) per year to provide wood for the average household.

The clearance of trees in highland India is one factor which has increased the severity of floods in recent years and in other areas such as the Sahel region in Africa, it has increased desertification.

Deforestation creates a vicious cycle of poverty: a diminishing supply of woodfuel for cooking means that less food is cooked properly and lack of cooked food adversely affects nutrition. Urban dwellers in Africa spend as much as a quarter of their income on woodfuel or charcoal. Charcoal is favoured in towns because it is easier and cheaper to transport. However, it takes 10 tonnes of wood to make 1 tonne of charcoal, yet charcoal gives out only about 3 times the heat.

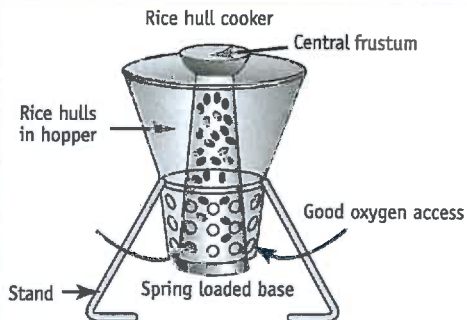
EXERCISE 6 (cont.)

In Kenya, women's groups designed an improved hour glass shape metal stove with a ceramic liner which uses up to 40 per cent of the heat from a fire to cook food. The 'Jiko' (the word means 'stove' in Swahili) saves annually up to \$65 per household, which may be about one-fifth of the annual income. It is so successful that it is being used by many people, both poor and affluent.

Kenyan 'Jiko', ceramic-lined cooking stove



In countries of Asia, a new cooker has been developed which burns waste rice hulls and provides excellent cooking by using cheap waste material. In order to burn rice hulls quickly, without producing smoke, oxygen must be freely available to the seat of the fire. A metal cooker, of simple design allows the rice hulls to burn freely without smoke, and use energy for cooking from a cheap waste product.



WHAT IS APPROPRIATE TECHNOLOGY

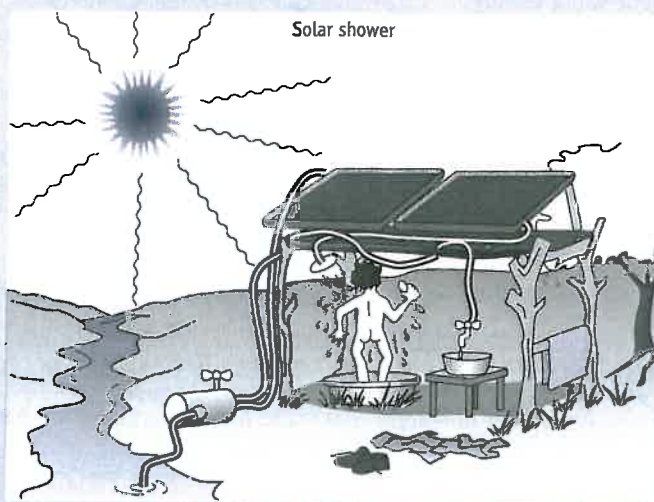
An appropriate technology (AT) is affordable, looks after the health of people and the environment and uses resources efficiently. For example a solar water heater, a straightforward method of 'capturing' renewable solar energy and putting it to use, is an appropriate technology: so are bicycles, hand powered washing machines, wood stoves, solar ovens and dryers, personal computers, waste recycling systems aquaculture methods of farming. Some tools, machines and methods can be more appropriate than others, depending on the situation.

A technology or organisation which is cost-effective and locally controlled is appropriate; it is a technology which solves problems. Technology is a combination of product, skills and acquired knowledge; it is a form of organisation and is part of culture.

'Appropriate' depends on:

WHO is using
WHAT it is being used for
WHERE it is being used

Sometimes, appropriate technology is described as 'The right tools and methods for the job'.



ADVANCED, INTERMEDIATE AND TRADITIONAL TECHNOLOGIES

We use technologies to help us do many things. In Australia (and other 'developed' countries, also known as 'The North' or 'First World') we use a great deal of advanced technology which is capital-intensive, labour-saving, sophisticated, uses non-renewable resources and which emphasises urban development.

By contrast, those living in the 'developing world' (also known as 'The South', or 'Third World') use a traditional technology requiring slow, hard labour, intensive work by hand, using cheap, simple tools which are easy to make. They typically live in villages and do not always have access to electricity or engine-driven machines.

The concept of intermediate technology grew out of a search for a level of technology which was better suited to the needs of 'The South'. Attempts to transfer technology from 'The North' directly have largely failed to solve the problems of 'The South' and have often made them worse.

Some technologies are found in all these technological 'worlds', e.g. traditional people may have some access to buses or cities. Westernised people sometimes do things like dig their gardens or pick fruit or vegetables by hand or walk to work. It's important to understand that traditional technology does not mean 'backward' technology or that Westernised technology is all 'good'. Technologies should be judged by how appropriate they are. Some are more appropriate than others, e.g. non-renewable resources.

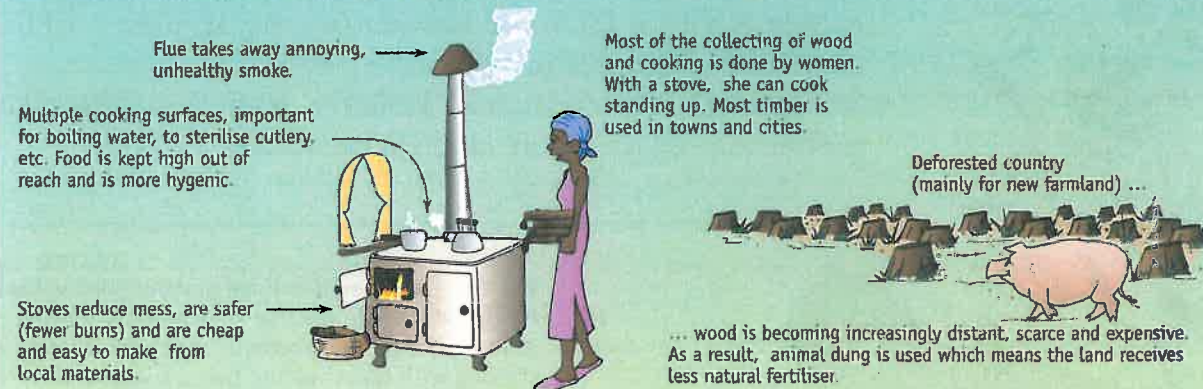
EXERCISE 6 (cont.)

TABLE SHOWING EXAMPLES OF TECHNOLOGIES IN THE NORTH AND SOUTH

	ADVANCED TECHNOLOGY OF THE NORTH	INTERMEDIATE TECHNOLOGY OF THE SOUTH	TRADITIONAL TECHNOLOGY OF THE SOUTH
TRANSPORT	Jet planes, trains, cars, buses, walking	Bicycle, mopeds, buses, 4WD, minibus, cycle with trailer	On foot, donkeys, bullocks, boat/canoes, camels
COOKING	Microwave ovens, gas/electric stoves	Stoves, solar cookers, biogas	Open fire, drying in sun
LIGHTING/ENERGY	Mains electricity Some solar, wind, (from coal, gas, oil), geothermal, nuclear, tidal	Solar, micro-hydro, biogas	Daylight, candles, open fire
FARMING/FISHING	Tractors, combines, chemical fertiliser, plant breeding, trawlers	Ploughs, simple small machines, wheelbarrow, outrigger canoe	By hand, human and animal fertiliser
HEATING/COOLING	Reverse cycle air conditioning, fridge, insulators	Green fridge, simple fans, some by hand	Shade, shelter, use of clothing
COMMUNICATION	TV, fax, mobile phone, newspapers	Pedal-powered radio or phone	Visitors, e.g. doctors; storytelling; word of mouth, drums

'To most people, progress has become synonymous with imitation of the Western models but whenever we have followed models from the industrial society and have been insensitive to our own circumstances the results have not been happy. The time has come for us to think deeply about the kind of progress we want' (Indira Gandhi)

WOOD STOVES, AN INTERMEDIATE APPROPRIATE TECHNOLOGY



1 Consider the positive and negative effects of alternative energy sources as suggested in Table 8.3. Divide the class into debating groups, with an equal number of affirmative and negative teams. After researching the topic, conduct a series of debates on the motion: 'That the benefits of alternative energy sources outweigh their negative effects.'

2 Write a 500-word essay on the following question: 'How relevant and important is the concept of alternative energy sources for the poorer countries of the world, such as those in Africa and Central America?' Consider the concepts and ideas in Figure 8.16 to help you with this question, as well as using research.